

Fresh milk products and juices in liquid packaging board
- A case study for the conformity assessment of the
packaging systems with EU directive on packaging and
packaging waste with the help of CEN-standards

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Contents

1. SCOPE	1
2. BACKGROUND PURPOSE	1
2.1. Directives and standards	1
2.2. Use of liquid milk products and juices in Finland	4
2.3. The aim of the Calpa project	4
2.4. Project partners and steering group	4
3. PACKAGING SYSTEM DESCRIPTION	5
3.1. Products	6
3.2. Packaging materials used	7
3.3. Distribution chain	8
3.4. Recovery and recycling	8
3.5. The quality and purchasing agreements and the management systems in each company	8
4. THE MANAGEMENT SYSTEM	9
4.1. Company responsibility in the management system, producing and filling of data	9
4.2. Statement of conformity with EU directive 94/62/EC essential requirements	11
4.3. Prevention checklist summary	12
4.4. Reuse checklist summary	13
4.5. Recycling checklist summary	14
5. CONCLUSIONS	15
5.1. Conformity assessment	15
5.2. Future development	15
 Annex 1	 16
Description of Pure-Pak packaging system for milk in Finland	
Annex 2	18
Recovery and recycling of liquid packaging board in Finland	
Annex 3	20
Standard EN 13428:2004 Prevention checklists, references are filed by the companies	
Annex 4	27
EN 13430:2000 table C2 for each part of the packaging system	

1. SCOPE

This project, named Calpa project, is a case study to show one example to demonstrate how to assess conformity with the EU Directive on packaging and packaging waste (94/62/EC) with the help of revised CEN -standards EN 13427-13431:2004 and already harmonized standard EN 13432:2000. The project is using as an example liquid packaging board (LPB) used for liquid milk products and juices, including the distribution systems. The assessment is based on production-chain management process.

2. BACKGROUND AND PURPOSE

2.1 Directives and standards

The EU directive on packaging and packaging waste (94/62/EC) has been implemented into the Finnish legislation in 1997 as a Council of State Decision on packaging and packaging waste (VNp 962/1997).

The essential requirements for packaging are presented in the Annex II of the directive. Further in this report they are referred to according to their numbering:

1. Requirements specific to the manufacturing and composition of packaging
 - Packaging shall be so manufactured that the packaging volume and weight be limited to the minimum adequate amount to maintain the necessary level of safety, hygiene and acceptance for the packed product and for the consumer.
 - Packaging shall be designed, produced and commercialised in such a way as to permit its reuse or recovery, including recycling, and to minimize its impact on the environment when packaging waste or residues from packaging waste management operations are disposed of.
 - Packaging shall be so manufactured that the presence of noxious and other hazardous substances and materials as constituents of the packaging material or of any of the packaging components is minimized with regard to their presence in emissions, ash or leachate when packaging or residues from management operations or packaging waste are incinerated or landfilled.
2. Requirements specific to the reusable nature of packaging.
3. Requirements specific to the recoverable nature of packaging
 - Packaging recoverable in the form of material recycling.
 - Packaging recoverable in the form of energy recovery.
 - Packaging recoverable in the form of composting.

The EU Commission gave CEN TC 261 (European Committee for Standardisation) a mandate (Mandate M/317) in 1996 to make harmonised standards for the Directive 94/62/EC. These standards were formed as management standards (EN 13427- EN 13432) in order to show how to comply with the essential requirements of the directive. They were accepted as European standards in 2000. Only one of the standards was accepted as harmonised standard by the Commission (EN 13432:2000). The standards EN 13427-13431:2000 were not accepted for showing compliance with the essential requirements of the directive 94/62/EC.

Compliance with the essential requirements of the directive 94/62/EC can be presumed in the case of packaging that complies with harmonised standards, the reference numbers of which have been published in the *Official Journal of the European Communities, OJEC*.

After having the second mandate from the Commission, the CEN/TC-261 has been elaborating the standards and supporting technical reports and produced revised standards EN 13427-13431. They were accepted by CEN member states in spring 2004.

Since the revised standards EN 13427-13431:2004 are new, their use is not common practice yet. Packers/fillers, packaging producers/converters, packaging material producers need and have been asking guidelines on the data collection, data documentation etc. It is not quite clear who is responsible for the different parts of the documentation.

Table 1. Names and functions of the European standards mandated in connection to the EU directive on packaging and packaging waste 94/62/EC.

Standard	Function	Official title
EN 13427	Guidelines	Packaging. Requirements for the use of European Standards in the field of packaging and packaging waste
EN 13428	Optimized use of packaging, 1.1.	Packaging. Requirements specific to manufacturing and composition. Prevention by source reduction
EN 13429	Reusable packaging 2	Packaging. Reuse
EN 13430	Material recoverable packaging, 3.1.	Packaging. Requirements for packaging recoverable by material recycling
EN 13431	Energy recoverable packaging, 3.2.	Packaging. Requirements for packaging recoverable in the form of energy recovery, including specification of minimum inferior calorific value
EN 13432	Compostable packaging, 3.3.	Packaging. Requirements for packaging recoverable through composting and biodegradation. Test scheme and evaluation criteria for the final acceptance of packaging

Table 2 is showing the relationship of the standards, according to EN 13427:2004, to the directive 94/62/EC and its essential requirements.

Table 2 Relationship between the five packaging standards, and one CEN report (EN 13427:2004)

1 Manufacturing and composition	2 Reuse	3 Recovery
1.1 Prevention by source reduction (EN 13428:2004)	2 Reuse (EN 13429:2004)	3.1 Material recycling (EN 13430:2004)
1.2 Requirements for measuring and verifying the four heavy metals present in packaging (CR 13695-1)		3.2 Energy recovery (EN 13431:2004)
1.3 Requirements for measuring and verifying dangerous substances present in packaging (CR 13695-2))		3.3 Organic recovery (EN 13432:2000)

The assessment methods should be applied to total packaging system, according to the standard EN 13427:2004. Different requirements consider different levels in the system: Prevention by source reduction should be applied in all levels to the complete packaging system. Reuse and at least one of recovery methods should be applied to packaging at the level of functional units, and the minimization of heavy metals and other dangerous substances at the level of packaging components.

Opti-Pack is a Nordic project, the aim of which is to create a more unified documentation system. Opti-Pack project is financially supported by the Nordic Research Council. The CALPA project is a Finnish subproject to demonstrate the work needed in one practical case in Finland.

2.2 Use of liquid milk products and juices in Finland

In Finland an average person consumes annually over 200 litres of liquid milk products and juices. This makes about 6 kg packaging material per consumer p.a. Over 90 per cent of all liquid milk products are used fresh, and for them, a cold chain distribution system is used. The use of other systems, e.g. aseptic packaging for UHT -milk, is not common in Finland.

The most common packaging is gable top package made of liquid packaging board (carton coated with plastics). It usually contains 1 l or 1 kg product (milk, sour milk, yoghurt, juice) The gable top packaging is also produced in different other sizes, such as 1,5 l for high volume products (milk and some juices), 0,75 l (yoghurt), 0,5 l (milk, cream) and 0,2 dl (cream, single servings of milk). The annual consumption of gable top packaging in Finland is 800 million pieces.

2.3 The aim of the Calpa project:

The aim of the project is to create a simple system in conformity with the EU standards based on the packaging and packaging waste directive. The intention of the project is to provide the project partners a systematic approach applicable to all parties involved. The relevant information needed by a partner is transferred, when needed, via extranet or other electronic means.

For other packaging systems and other companies, each case should be assessed separately, case by case. This project report can be used by other companies as one example of supply chain assessment when assessing other systems.

2. 4 Project partners and steering group

- Elopak Oy, Jyrki Oesch
- Stora Enso Oyj, Päivi Harju-Eloranta
- Valio Oy, Leo Junkkarinen
- Pakkausteknologia - PTR ry (Association of Packaging Technology and Research), Annukka Leppänen-Turkula and Terhen Järvi-Kääriäinen

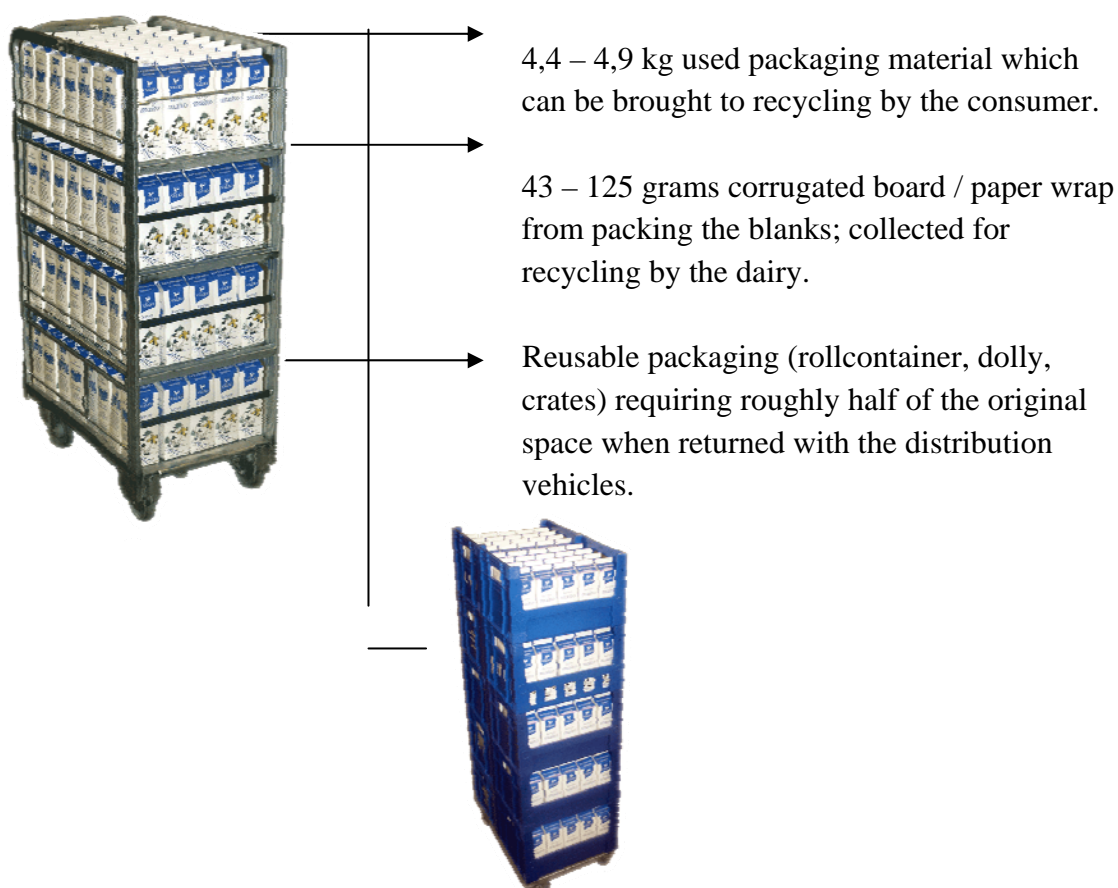
3. PACKAGING SYSTEM DESCRIPTION

The Pure-Pak packaging system for milk products is schematically described in annex 1.

The use of packaging materials:

- For one liter milk 27,6 grams liquid packaging board (this equals 4,42 kg liquid packaging board per rollcontainer or dolly system unit).
- For one liter juice 30,7 grams liquid packaging board (equals 4,91 kg / rollcontainer or dolly system unit).
- For 1000 pieces of one liter packages 781 grams corrugated board or 267 grams paper wrap as packaging material (equals 125 or 43 grams / rollcontainer or dolly system unit), used in blank transportation.
- Rollcontainer weights abt 35 kg; made of steel; life expectancy 7 years; material recycled when scrapped.
- Dolly system unit: the dolly weights abt. 8 kg; made of steel; life expectancy 10 years; material recycled when scrapped, 8 pcs of crates made of HDPE weighting together 8kg; life expectancy 4 years; material recycled when scrapped.

160 liters milk brought to retail shop ends up with:



3.1 Products

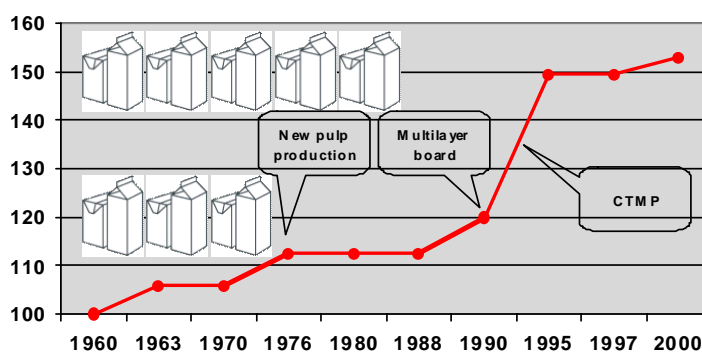
This Conformity Assessment is handling liquid packaging board used for liquid milk products and juices, including the distribution system.

Milk

There are several different types of milk in Finland containing different per cent of fat and several consumer packaging sizes (1, 1.5, 0.5 and 0.2 litres). The milk-type does not affect the packaging material but packaging size does.

Barriers are needed against light and moisture.

50% more milk cartons from the same amount of wood



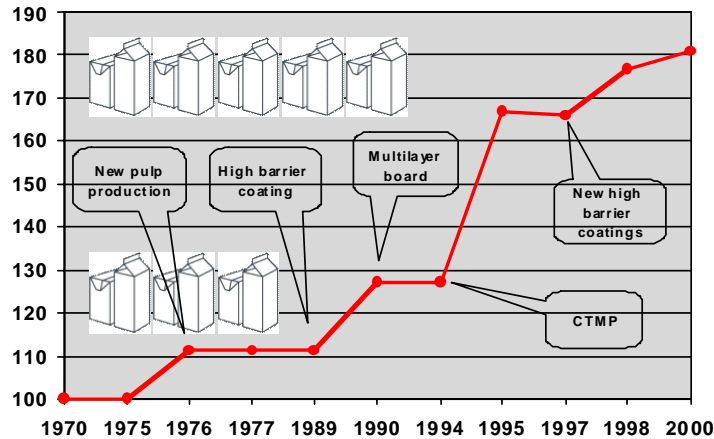
Picture 1. Because of technical development it has been possible to reduce the basis weight of the one liter milk carton and the use of wood in the production during the last forty years, shown in the picture as a relative index.

Juices

There are several different types of juices (orange, apple, tomato....).

Barriers are needed against light, oxygen, aroma substances and moisture.

80% more juice cartons from the same amount of wood



Picture 2. Resource intensive product development and innovative R & D has made it possible to decrease the weight of the juice carton during last thirty years, shown here as a relative index.

Other liquid milk products

- Sour milk
- Yoghurt
- Cream

For the most part the consumer packaging for these products are similar to milk packaging.

3. 2 Packaging materials used

Liquid packaging board (LPB) is formed from several layers: carton board giving the packaging stiffness and light barrier, coated on both side with plastics. The carton board is produced with a 3-layer technique, CTMP is used for the middle layer.

If the product needs only moisture barrier, the plastic coating is generally PE-LD. If excellent oxygen barrier is needed, different plastics can be used, for example EVOH together with PE-LD, normally extruded on the carton board. Also aluminium foil is used for special purposes, such as aseptic packaging. The use of different polymers and aluminium foil depends on the end use of cartons.

Since the main goal of all the companies involved is continuous improvement and development of the products and the processes, for both economical and ecological reasons, the weight of the packaging has been decreasing and for instance the aluminium in the packaging has been replaced by EVOH for fresh products. Many Valio – Stora Enso studies have shown that these changes have no significant effect on the shelf-life in the cold chain.

3.3 Distribution chain

The distribution chain from the dairies to retail shops is using rollcontainers, dollies and plastic crates, all reusable. The crates are used only, when small volumes of special products are delivered to small shops. A rollcontainer is used for seven years, as an average. The life of a dolly is almost unlimited and the average age of a plastic crate is four years. High volume products are sold directly from the rollcontainer to consumers in self-service stores. The consumer is the first person, who touches the packed carton, as the production lines at a dairy are fully automatic.

Other transportation needs (raw materials, blanks, waste etc) are described in annexes 1 and 2.

3.4 Recovery and recycling

LBP is recoverable material and also production residues are effectively recovered. All packaging in the system can be recovered after use. LBP and the materials from the distribution systems are recycled. Recycling of LPB is described in annex 2.

Corenso United Oy Ltd in Varkaus, Finland, is the first company in the world to develop a total recycling process, in which all the components of used liquid packaging and wrappings – fibres, plastics, and aluminium, can be separately recovered and utilised. The fibres are used for manufacturing cores of reels or corrugated board. The plastic layers of multilayer material is converted into combustible gas for energy in the Corenso mill. Corrugated board from the blanks transportation is recycled in separate recycling process. The metals are recycled by Kuusakoski Oy, and the plastic crates by Arca System Oy.

3.5 The quality and purchasing agreements and the management systems in each company

All the companies involved have both ISO 9 000 and ISO 14 000. Other management systems used are *In-house control systems* including HACCP and GMP.

IDF (International Dairy Federation) has regulations followed in all dairies.

The packaging materials are produced according to agreed specifications and the companies have supply chain agreements. All the data referred to is filed by the companies according to table 3. Each company is responsible for the data and part of the management system, correspondingly. Data is provided in confidence on request.

4. THE MANAGEMENT SYSTEM

4.1 Company responsibility in the management system, producing and filing of data

Each company in the management chain is responsible for certain part of the system. According to the Finnish legislation (Council of State Decision VNp 962/1997) the packer /filler is responsible for the packaging put on the market. It is clear that packer/filler will require data from other partners in the chain, also responsibilities for certain aspects belong to others but the packer/filler. The Umbrella standard EN 13427 is showing the relationship between the essential requirements of the directive (94/62/EC) and the designated assessment criteria for packaging (EN 13427, annex A). The same table can be used as a reference to supply chain assessment.

Table 3 is a modification of EN 13427, annex A, table A.1. It is showing each contracting party responsible for the corresponding data in the directive 94/62/EC, responsibility to the parts of the management system and also which of the standards EN 13427-13432 each company should be using. The numbers in the section 3 *Reference to company assessment* are referred to standards and CEN reports:

- 1.1 Prevention by source reduction, EN 13428
- 1.2 Requirements for measuring and verifying the four heavy metals present in packaging, CR 13695-1 (CEN technical report)
- 1.3 Requirements for measuring and verifying dangerous substances present in packaging, CR 13695-2 (CEN technical report)
- 2 Reuse, EN 13429
- 3.1 Material recycling, EN 13430
- 3.2 Energy recovery, EN 13431
- 3.3 Organic recovery, EN 13432

All of the companies in the project, Valio, Elopak and Stora Enso are familiar with all of the standards, they have been studying them together. Companies taking care of the recovery/recycling of the materials are included in the system. They are having agreements with the other parties on their responsibilities.

4.3 Statement of conformity with EU directive 94/62/EC essential requirements

All packaging placed on the market should be in compliance with the EU directive on packaging and packaging waste 94/62/EC. The compliance can be shown e.g. by using harmonized standards. This project is using the revised standards (EN 13427-13431:2004) and the one existing harmonized standard (EN13432:2000), with the presumption that the revised standards will be accepted as harmonized. Statement of conformity with the directive is done according to the example of statement of compliance in EN13427:2004.

Each company is filing the data gathered in company assessments. Table 4 is showing the summary assessment of the management system (EN 13427:2004).

Table 4. Summary of assessment of the management system (EN 13427:2004)

Packaging identification: LBP for milk products and juices, inc. distribution system		Assessment reference	
Identification of principal materials used: LPB, steel, plastic (PE-HD)			
Standard/Report	Assessment requirement	Claim	Note
1.1 Prevention by source reduction	Ensure only minimum adequate amount of material in the packaging system (EN 13428)	Yes, for the whole packaging system	EN 13428 tables, annex 3
1.2. Heavy metals	a. Ensure below maximum permitted levels for components (CR 13695-1)	< 100 ppm (LPB) Rollcontainers and dollies are made of steel	PTR report 45, Stora Enso test reports
1.3 Dangerous substances	b. Ensure in compliance with EN 13428 (CR 13695-2)	Not intentionally added	Stora Enso, Elopak
2. Reuse	Ensure reusability in all terms of the standard for the functional packaging unit (EN 13429)	LBP: No Distribution system: Yes, rollcontainer: average age 7 years dolly: av. age 10 years plastic crate: age 4 years	Statistics. Valio,
3.1 Recovery by material recycling	Ensure recyclability in all terms of the standard for the functional packaging unit (EN 13430)	LPB carton Rollcontainers, dollies Plastic crates	Corenso Kuusakoski Arca Systems Oy
3.2 Energy recovery	Ensure recoverability in all terms of the standard for the functional packaging unit (EN 13431)	LPB has calorific gain of 10 MJ/kg, 100 % organic, Not relevant for rollcontainers or dollies	EN 13431 and constituents of LPB, Stora Enso
3.3 Organic recovery	Ensure compostability in all terms of the standard for the functional packaging unit (EN 13432)	Not relevant Fibrous material is biodegradable	

4.4 Prevention checklist summary

Each company has done their own prevention assessments, using the EN 13428 tables for the work, annex 3. These assessments were worked together to find out the most important critical area. Product protection is the most important function for packaging, but also the other critical areas are considered to be equally important.

Table 5 is showing the management system summary checklist (EN 13428:2004). This prevention checklist is for LPB.

Table 5. Prevention checklist summary (EN 13428:2004)

Packaging prevention by source reduction	Company. LPB management chain		
Assessment checklist	Packaging type: LBP (Pure-Pak) for milk products and juices		
Performance criterion	Most important / relevant requirement	Critical area	References
Product protection	No leakage; Barrier against light (milk); Barrier against light and oxygen (juice)	Yes	IDF; Customer spec's; Valio – Stora Enso development reports 1990-2002
Packaging manufacturing process	Waste level; Stiffness; Runnability; Yield	Yes	Internal spec's; long time practice
Packaging / filling process	Runnability: quality parameters Good heatsealing: bottom and top	Yes	Customer spec's; In-house control system, incl. HACCP and GMP; Valio – Stora Enso project reports 1990-2002; Long time practice
Logistics	Strength; Integrity during distribution	Yes	Research results; Transport tests; In-house control systems; Long time practice
Product presentation and marketing	Printability, Colour of board	No	Industry spec's
User / consumer acceptance	Organoleptical properties and leak proof; easy to use and handle	Yes	Quality data; EC 89/109/EEC; Long time practice
Information		No	
Safety	Microbiological purity; Tamper evident	Yes	GMP and HACCP
Legislation	Food contact approvals; Hygienic requirements	Yes	EC 89/109/EEC, KTM decision 400/1996, CoE Resolution AP (2002); Food Act (361/1995); Codex Committee on Food Hygiene CX/FH 03/9, 9/2002
Other issues	Renewable and recyclable;	Yes	Corenso process; Suomen NP-kierrätys Oy ¹ , Valio's environment report 1999, Valio's environmental goals 2002-2005;

¹ Finnish LPB Collection Ltd

The reusable distribution packaging has, as the critical areas, packaging/filling processes and logistics, with Valio - Elopak research projects and customer specifications as references.

4.5 Reuse checklist summary

The packaging system for milk-products and juices includes a distribution system using only reusable transport packaging. Reuse is claimed for the rollecontainers, dollies and plastic crates. Table 6 is showing the reuse system summary checklist (EN 13429) for the distribution system.

Table 6. Reuse checklist summary (EN 13429:2004)

Packaging identification: Distribution packaging for Pure-Pak system	Assessment reference
Identification of significant materials used: Steel, PE-HD	
Enabling criteria	References and source
Taking into account the particular circumstances/location of use, it is the intention that the packaging is to be reused.	Yes: Rollcontainer, dolly, plastic crates in Pure-Pak closed loop system (Valio's distribution), see chapter 3. Packaging system description
The design of the packaging enables the principal components to accomplish a number of trips or rotations in normally predictable conditions of use.	Long term experience in use for rollcontainers, dollies and plastic crates
The packaging can be emptied/unloaded without significant damage, beyond that which can be viably repaired.	Long term experience in use for rollcontainers, dollies and plastic crates
The packaging can be reconditioned according to EN 13429 Annex B (cleaned, washed, repaired) by whatever method and to whatever level may be specified, whilst maintaining its ability to perform its intended function.	Long term experience in use for rollcontainers, dollies and plastic crates
Any reconditioning process within the control of the packer/filler is managed in a manner that minimises its impact on the environment.	Long term experience in use for rollcontainers, dollies and plastic crates
A reconditioning process is available and is applicable to reusable packaging, incorporating all essential elements listed in Annex B of the standard EN 13429.	Valio uses 2-3 companies to repair the rollcontainers, dollies etc
The packaging can be refilled/reloaded without risk to the integrity of the product or to the health and safety of those responsible for doing so	Long term experience in use for rollcontainers, dollies and plastic crates
In the circumstances and locations of intended use, the arrangements (organisational, technical, financial) are in place and available to make reuse possible.	Long term experience in use for rollcontainers, dollies and plastic crates
The reuse system identified as appropriate, in the actual circumstances of use, complies with one of the specifications from clause 6, EN 13429.	Closed-loop distribution system managed by Valio

In the light of the responses recorded above, this packaging system is deemed to be reusable within the terms of EN 13429.

4.6 Recycling checklist summary

All of the packaging in the system, whether one-way or reusable, are recyclable at the end of their lives. The industry in Finland has long traditions on recycling of paper and metals (also glass), other systems have been developed according to special needs.

Table 7 is showing the material recycling summary checklist (EN 13430, Compliance summary statement) for the LPB including distribution system used for milk-products and juices. Annex 4 is showing the EN 13430 tables for declaration of percentage of a functional unit of packaging available for recycling.

Table 7. Recycling checklist summary (EN 13430:2004)

Packaging identification/description		Assessment Reference	
Pure-Pak, including distribution			
Criteria	Response	Reference	
Is design and control of all stages of production, packing/filling including the materials used sufficient to maintain the suitability of the packaging for the recycling process?	Yes	Long term experience in use	
Does the design and control of components used and of the method of construction facilitate effective emptying?	Yes	Long term experience in use	
Does the design and control of the components used and of the method of construction facilitate the end-user role of separation, when necessary, to assist collection?	Yes	Long term experience in use	
Does the design and control of the components used and the method of construction ensure compatibility with collection and sorting systems?	Yes	LPB: NP-Kierrätys Oy Metals: Kuusakoski Oy Plastics: Arca Systems Oy	
Is the method of construction, and the combination of raw materials and components (including additives) suitable for the recycling process?	Yes	Internal spec's	
Are any necessary systems of sorting, in preparation for the recycling process, suitable for the achievement of material recycling?	Yes	NP-Kierrätys Oy Paperinkeräys Oy	
Are the construction, composition and separability of components such as to minimize releases to the environment in the recycling process?	Yes	Long term experience in use	
Is the control of all stages of production, packing/filling sufficient to ensure that the releases to the environment in the recycling system, are minimized?	Yes	Long term experience in use	
Can the packaging be emptied of contents sufficiently to minimize any additional emissions/ residues from the recycling process?	Yes	Long term experience in use	
Can the packaging be collected and sorted to minimise any additional residues/emission in the subsequent recycling operations?	Yes	Long term experience in use	

5. CONCLUSIONS

5.1 Conformity assessment

According to the procedures presented in standards EN 13427-13432, the liquid packaging board (LPB) used for liquid milk products and juices, including the distribution systems, are in conformity with the EU directive on packaging and packaging waste (94/62/EC), assuming the harmonisation of the EN:s.

5.2 Future development

The companies participating the project have committed themselves to a continuous development of the materials and distribution systems as part of their management systems. This will, in time, end up with more environmentally efficient packaging system. Every major development stage or result will be assessed according to the system presented in this report, and the results will be accordingly documented by the companies.

- | | |
|----------------|---|
| Annex 1 | Description of Pure-Pak packaging system for milk in Finland |
| Annex 2 | Recovery and recycling of liquid packaging board in Finland |
| Annex 3 | Standard EN 13428:2004 Prevention checklists, references are filed by the companies |
| | 3 a. Valio |
| | 3 b. Elopak |
| | 3 c. Stora Enso |
| Annex 4 | EN 13430:2000 table C2 for each part of the packaging system |

Annex 1, 1/2

Description of Pure-Pak packaging system for milk in Finland

Manufacturing of LPB at
StoraEnso Mills in
Imatra.

StoraEnso

Separate description, see Annex 3 C

Receiving and acceptance
of material at Elopak Lahti
Converting Plant

Elopak

Detailed mechanical, chemical and microbiological
specifications of material stated in the delivery
agreement.

One roll abt. 1 100 kg's or 33 000 one liter
packages.

One truckload material equals 1 000 000 packages.

Printing, creasing and
cutting of material.

Elopak

Printing according to customer's instructions.

Printing inks in conformity with EU-standards.

Creasing and cutting according to Elopak standards.

Flame sealing and
automatic packaging and
palletising of blanks.

Elopak

Flame sealing according to Elopak standards.

Packaging and palletising agreed with customer.

One pallette contains 22 000 one liter blanks
(packages). The weight of one liter milk blank is
less than 28 grams.

Storage, despatch and
transportation

Elopak

Storage according to Elopak standards.

All transportation vehicles inspected before loading.

The whole blanks manufacturing process is covered
by ISO 9002, ISO 14001 and HACCP (standard DS
3027) certificates.

**All material waste from manufacturing is
recovered and recycled.**

Annex 1, 2/2

<p>Receiving of material at Dairy</p> <p>Valio</p>	<p>1-2 truckloads equals one working day's packaging material needs of a modern big dairy.</p> <p>The specifications for the blanks are stated in detail in the delivery agreement.</p>
<p>Filling of milk (or juice) products into blanks. Packaging of blanks into crates on dollies or rollcontainers. Despatching from automatic cold storage.</p> <p>Valio</p>	<p>Because Pure-Pak is a packaging system, the filling machines and the packaging materials are compatible. The machines are designed according to IDF-hygiene standards. Production efficiency and waste level is measured against standards and corrective actions are made, if necessary. Milk is processed and packed only against customer order.</p> <p>Basically all liquid milk products are packed in returnable rollcontainers or returnable plastic crates on returnable dollies both containing 160 l liquid milk product, 45 kg or less returnable packaging material (rollcontainers, crates and dollies) and 4,3 kg's liquid packaging board (blanks), which can be recovered and recycled.</p>
<p>Distribution to retail shops and catering.</p> <p>Valio</p>	<p>Distribution performance monitored, optimised and developed on continual basis.</p> <p>All returnable units collected when distributing. Returnable unit serves also as a point of sale if required.</p>
<p>After the product is consumed, the packaging can be returned to a recycle bin.</p> <p>Consumer</p>	<p>Over 950 collection bins in Finland, where the used milk packaging material can be returned.</p> <p>Suomen NP-Kierrätys, Paperinkeräys and Corenso have agreed on a system and it's financing as described on a separate sheet.</p>
<p>Collection, storing and despatch of material to Corenso</p> <p>SNPK</p>	<p>Fibre used in production of core board. Polymers used in energy production at Varkaus Mills.</p>

Recycling of Liquid Packaging Board in Finland and Suomen NP-Kierrätys Oy

History

Trial tests based on separate collection were made 1992-94 together with Pakkausteknologia - PTR ry (Association of Packaging Research and Technology). The results were published in PTR report nr. 41/1995.

SNPK was founded in early 1995 and its objective is to develop and organize the recovery and recycling of packages made of LPB according to EU and local regulations. It also reports the results through Pakkausalan Ympäristörekisteri PYR Oy (Packaging Environmental Register PYR Ltd) to the authorities. The founders and shareholders (each 25%) are Elopak Oy, Stora Enso Oyj, Tetra Pak Oy and Valio Oy.

Organisation and financing of operations

All products packed in LPB-material are subject to recycling-fee, which is paid directly to SNPK or through PYR. In both cases there is a contract that states the amount of fee to be paid.

The recycling-fee covers the expenses caused by collection, storing and transportation of material. All administration, communication and other project costs are paid directly by the shareholders.

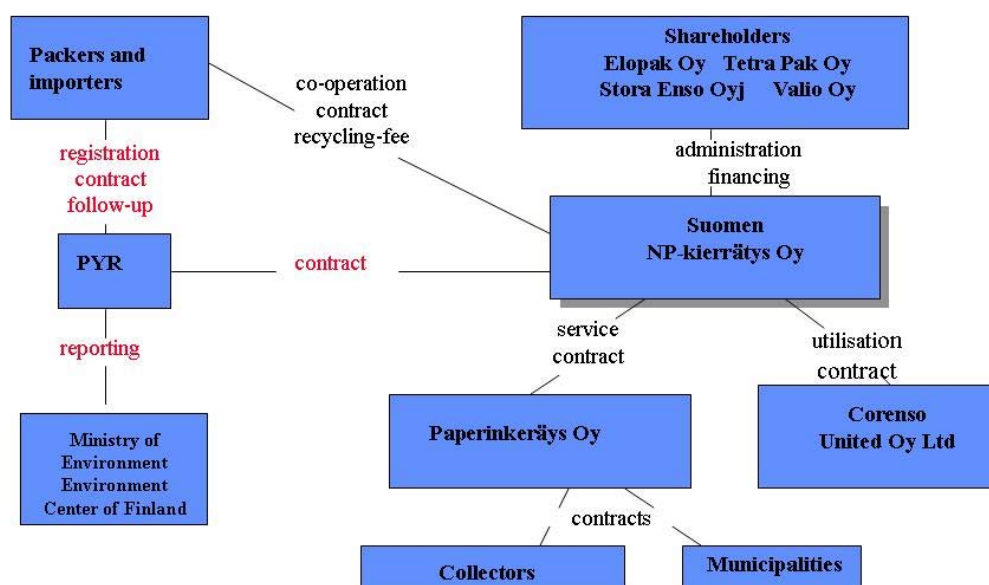
SNPK has a contract with Paperinkeräys Oy, that covers the collection, storing and transportation of used LPB packaging material. Also a contract with Corenso United Oy Ltd has been signed in order to secure the utilisation of the material. Most of the material is today used as a raw material for core board.

In 2003 the recycling-fee is €0,572 / 1000 packages or €20 / ton. The estimated recycling volume is 5000 tons. (Note: According to several research results about 12 000 tons is burned in homes mostly in rural areas.)

Future

Already now a part of the material is collected together with corrugated board and folding boxboard. If the recycling industry can accept this kind of mixture in greater extend, as it now seems, there will be more collection bins, where the consumers can place all of their fibre based packaging waste. This is certain to increase the recycled packaging waste amounts as it is much more convenient for consumers. At the same time it will ease the pressure on costs, because there will be more producers participating in the collection scheme and the collection costs are decreased.

Recovery and recycling of liquid packaging board in Finland



Annex 3

Standard EN 13428:2004 Prevention – Checklists for all the parties included

Annex 3a. Valio

Annex 3b. Elopak

Annex 3c. Stora Enso, including the standards used by Stora Enso

The critical area is different for different parties in the management chain. Some references, such as the EU Frame Directive 89/109/EEC, are affecting all the parties.

Quite often the critical area described in Annexes 3 is based on customer specifications.

Customer specifications are agreed between a customer and a supplier. Properties mentioned in a customer specification are measured according to international and/or national standards.

Annex 3 a

PACKAGING Prevention by source reduction	Company: Valio Ltd.	Leo Junkkarinen 19.3.2003	
Assessment checklist	Packaging type: Pure-Pak milk and juice packages		
Performance criterion	Most important / relevant requirement	Critical area	References
Product protection	Protect milk from the effects of light and oxygen, no leaks	Yes	Valio – Stora Enso development group test reports 1990 - 2002
Packaging manu- facturing process			
Packaging / filling process	Runnability: quality parameters Good heatsealing: bottom and top	Yes	Customer specifications; Valio – Stora Enso development group test reports 1990 - 2002; In-house control system including HACCP and GMP
Logistics	Stand the effects of whole logistics chain: storage, transportation and handling	Yes	Transport tests; In-house control system; Long time practice
Product presentation and marketing	Printability	No	
User / consumer acceptance	Easy to use and handle	Yes	Long time practice
Information	Packaging date and best before date	No	Local legislation and EU directives
Safety	Tamper evident No harmful substances	No	
Legislation	To meet a) the requirement on articles coming into contact with foodstuffs b) the hygienic requirements	Yes	EC directive 89/109/EEC; Food Act (361/1995); Decision on Food Contact Materials (400/1996); Codex Committee on Food Hygiene CX/FH 03/9, 9/2002
Other issues	Recycling		EU Directive 94/62/EC; Suomen NP-kierrätys Oy; Valio`s environment report 1999; Valio`s environment goals 2002 – 2005; Valio`s packages and the environment – information leaflet 3/ 2003
Signature		Date	

Annex 3 b

PACKAGING Prevention by source reduction	Company Elopak Oy	20.3.2003 Jyrki Oesch	
Assessment checklist	Packaging type: LPB		
Performance criterion	Most important / relevant requirement	Critical area	References
Product protection	No leakage; Barrier against light (milk); Barrier against light and oxygen (juice).	Yes	IDF, Juice producers association, Customer spec's
Packaging manufacturing process	Waste level; Stiffness; Runnability	Yes	Internal spec's; long time practice
Packaging / filling process	Runnability	Yes	Internal spec's; long time practice
Logistics	Integrity during distribution	Yes	Internal spec's
Product presentation and marketing	Printability; Shade of board		Industry spec's
User / consumer acceptance	Ease of handling		
Information	Not relevant		Customer spec's
Safety	Tamper evident		
Legislation	Food contact approvals	Yes	EC 89/109/EEC
Other issues	Yield		
Signature		Date	

Annex 3 c

The source reduction of Liquid Packaging Boards produced by Stora Enso Oyj, Imatra Mills

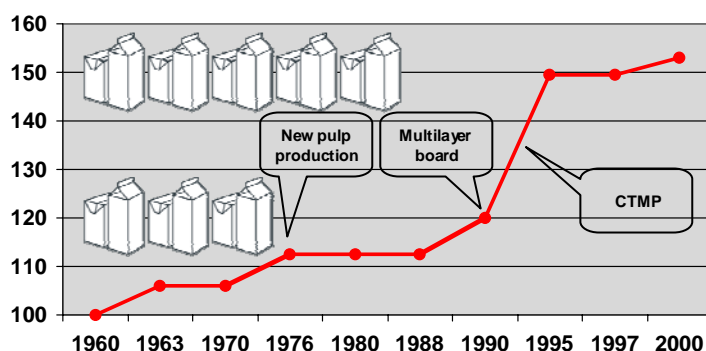
The raw material for paperboard is wood – a renewable resource. Liquid packaging boards are manufactured at a integrated mill in Imatra, where both pulps and board are produced. When paperboard is produced at a integrated mill, the energy used is mainly renewable energy derived from wood and the pulping process.

Liquid packaging board is an efficient material that can prevent product loss by protecting packed material against physical damage, contamination and light. Liquid packaging boards can be coated with polyethylene and with different polymers depending on the end use of cartons.

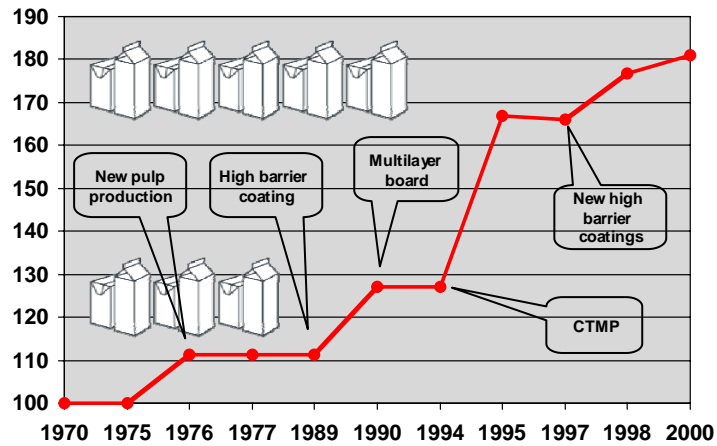
Because of 3-layer technique and the use of CTMP for the middle layer, Stora Enso has been able to reduce the basis weight of the liquid packaging board. In practice, this means that from the same amount of wood are received more cartons.

Cartons are composed of organic material more than 50%, thus they shall be considered recoverable in the form of energy. Calculated calorific gain of liquid cartons is about 10 MJ/kg.

50% more milk cartons from the same amount of wood



80% more juice cartons from the same amount of wood



The following items influence on the functionality of LPB:

- strength properties
- organoleptic and microbiological properties
- printability and optical properties
- environmental aspects - renewable resources and recyclable packages

Table 1. Conformity of liquid packaging board with EN 13428:2004 - Standard on Prevention by source reduction

P ACKAGING Prevention by source reduction	CompanyStora Enso, Imatra Mills	14.3.2003 Päivi Harju-Eloranta	
Assessment checklist	Packaging type. LPB		
Performance criterion	Most important / relevant requirement	Critical area	References
Product protection	Barrier and sizing properties	Yes	Quality data
Packaging manufacturing process	Paper technical properties	No	Customer specifications
Packaging / filling process	Stability	No	Customer specifications
Logistics	Strength	Yes	Research results
Product presentation and marketing	Printability	No	Customer specifications
User / consumer acceptance	Organoleptical properties and leak proof	Yes	Quality data, EC 89/109/EEC on materials and articles intended to come into contact with foodstuffs
Information	Printability	No	Customer specifications
Safety	Microbiological purity	Yes	GMP and HACCP
Legislation	Food contact approvals	Yes	EC 89/109/EEC, KTM decision, CoE Resolution AP (2002) 1 on paper and board materials and articles intended to come into contact with foodstuffs
Other issues	Renewable and recyclable	Yes	Corenso process
Signature		Date	

TESTING METHODS AND STANDARDS

Quality Service

Measurement	Unit	Standard
Adhesion, ts/bs		mill method
Basis weight	g/m ²	ISO 536:95
Brightness, ts/bs (R457, D65)	%	ISO 2470:99
Caliper	µm	ISO 534:88 (SCAN-P7:96)
L*a*b*, ts		ISO 2470:99, T 5270:94
Moisture	%	ISO 287:85
PE-amount, ts/bs	g/m ²	Mill Method
REP lac. 4°C/24 h	kg/m ²	Mill Method
Roughness Bendtsen, ts/bs	ml/min	ISO 8791-2:90
Scott Bond	J/m ²	TAPPI 569 pm -00
Smoothness PPS, ts/bs	µm	ISO 8791-4/1992
Stiffness L&W 15 °, md/cd	mN	ISO 2493:92, (SCAN-P 29:95)
Tensile strength L&W md/cd	kN/m	SCAN-P 67:93
Wet tensile strength L&W, md/cd	kN/m	SCAN P 20:95
Visking	mN/m	ASTM D 2578-84
Z-strength	kPa	SCAN-P 80:98

EN 13430:2004 Table C 2 Declaration of percentage of a functional unit of packaging available for recycling

1	Functional Unit of Packaging	Description:	Liquid packaging board, milk	
	Component see note 1	Component 1	Component 2	Component 3
2	Description	Polymer coated carton board		
3	Weight of component as % of total functional unit	100		
4	If the whole component is accepted for recycling based on national, European, international commercial standards or specifications, give detailed reference	NP-kierrätys Oy Corenso Ltd		
5	If the component complies with such standard(s) or specification(s) fill in line 6 - and then go to line 11 and note that 100% is available for recycling. If not, continue with line 6			
6	Intended material stream See note 2	Corenso Ltd/ paper		
7	Identification of constituents within the component likely to create problems in the overall recycling such that alternative recovery is recommended. Reference to CEN Report CR 13688:2000			
8	Constituents liable to cause problems in collection and sorting			
9	Constituents liable to cause problems in recycling			
10	Constituents liable to have a negative influence in the recycled material			
11	Percentage by weight of component available for recycling	100		
12	Percentage by weight of functional unit available for recycling (Line 11 x Line 3 / 100)			
13	Total percentage available for recycling (Sum line 12)	100	Date and Signature	

1	Functional Unit of Packaging	Description:	Plastic crate	
	Component see note 1	Component 1	Component 2	Component 3
2	Description	PE-HD crate		
3	Weight of component as % of total functional unit	100		
4	If the whole component is accepted for recycling based on national, European, international commercial standards or specifications, give detailed reference	PE-HD recycling system by Arca Systems Oy		
5	If the component complies with such standard(s) or specification(s) fill in line 6 - and then go to line 11 and note that 100% is available for recycling. If not, continue with line 6			
6	Intended material stream See note 2	plastic		
7	Identification of constituents within the component likely to create problems in the overall recycling such that alternative recovery is recommended. Reference to CEN Report CR 13688:2000			
8	Constituents liable to cause problems in collection and sorting	No		
9	Constituents liable to cause problems in recycling	No		
10	Constituents liable to have a negative influence in the recycled material			
11	Percentage by weight of component available for recycling	100		
12	Percentage by weight of functional unit available for recycling (Line 11 x Line 3 / 100)			
13	Total percentage available for recycling (Sum line 12)	100	Date and Signature	

1	Functional Unit of Packaging	Description:	rollcontainer	
	Component see note 1	Component 1	Component 2	Component 3
2	Description	steel wires	wheels	
3	Weight of component as % of total functional unit	98 %	2 %	
4	If the whole component is accepted for recycling based on national, European, international commercial standards or specifications, give detailed reference	Kuusakoski Oy		
5	If the component complies with such standard(s) or specification(s) fill in line 6 - and then go to line 11 and note that 100% is available for recycling. If not, continue with line 6			
6	Intended material stream See note 2	steel		
7	Identification of constituents within the component likely to create problems in the overall recycling such that alternative recovery is recommended. Reference to CEN Report CR 13688:2000			
8	Constituents liable to cause problems in collection and sorting			
9	Constituents liable to cause problems in recycling			
10	Constituents liable to have a negative influence in the recycled material			
11	Percentage by weight of component available for recycling	98 %	2 %	
12	Percentage by weight of functional unit available for recycling (Line 11 x Line 3 / 100)			
13	Total percentage available for recycling (Sum line 12)		Date and Signature	

1	Functional Unit of Packaging	Description:	Dolly	
	Component see note 1	Component 1	Component 2	Component 3
2	Description	steel plate	wheels	
3	Weight of component as % of total functional unit	90,5 %	9,5 %	
4	If the whole component is accepted for recycling based on national, European, international commercial standards or specifications, give detailed reference	Kuusakoski Oy		
5	If the component complies with such standard(s) or specification(s) fill in line 6 - and then go to line 11 and note that 100% is available for recycling. If not, continue with line 6			
6	Intended material stream See note 2	steel		
7	Identification of constituents within the component likely to create problems in the overall recycling such that alternative recovery is recommended. Reference to CEN Report CR 13688:2000			
8	Constituents liable to cause problems in collection and sorting			
9	Constituents liable to cause problems in recycling			
10	Constituents liable to have a negative influence in the recycled material			
11	Percentage by weight of component available for recycling	90,5 %	9,5 %	
12	Percentage by weight of functional unit available for recycling (Line 11 x Line 3 / 100)			
13	Total percentage available for recycling (Sum line 12)		Date and Signature	

Annex 4
5/5

1	Functional Unit of Packaging	Description:	Liquid packaging board, juice	
	Component see note 1	Component 1	Component 2	Component 3
2	Description	Polymer coated carton board	Only in a small portion of packages is a additional closure, PE-HD	
3	Weight of component as % of total functional unit	91	9	
4	If the whole component is accepted for recycling based on national, European, international commercial standards or specifications, give detailed reference	NP-kierrätys Oy Corenso Ltd	NP-kierrätys Oy Corenso Ltd	
5	If the component complies with such standard(s) or specification(s) fill in line 6 - and then go to line 11 and note that 100% is available for recycling. If not, continue with line 6			
6	Intended material stream See note 2	Corenso Ltd/ paper	Corenso Ltd / plastic	
7	Identification of constituents within the component likely to create problems in the overall recycling such that alternative recovery is recommended. Reference to CEN Report CR 13688:2000			
8	Constituents liable to cause problems in collection and sorting			
9	Constituents liable to cause problems in recycling			
10	Constituents liable to have a negative influence in the recycled material			
11	Percentage by weight of component available for recycling	100	100	
12	Percentage by weight of functional unit available for recycling (Line 11 x Line 3 / 100)			
13	Total percentage available for recycling (Sum line 12)	100	Date and Signature	